

## REMARKS

Reconsideration of this application, based on this amendment and these following remarks, is respectfully requested.

Claims 5, 6, 8, 9, 11, 12, 22, and 27 through 35 remain in this case. Claims 1, 2, 13, 14, 17, 18, 20, 21, and 23 through 26 were previously canceled. Claims 8, 27, 31, 32, and 34 are amended.

The undersigned notes the suggestion by the Examiner to amend Figures 1 and 2, because the oxygen atoms are not shown as attached to the surface. The undersigned believes, however, that Figures 1 and 2 are accurate in their depiction of the oxygen atoms as contained *within* the box labeled “surface”. As such, no amendment to Figures 1 and 2 is presented in this paper.

The Examiner newly rejected claims 5, 6, 8, 9, 11, 12, and 27 through 35 as failing to comply with the written description requirement of §112, first paragraph, and specifically rejected claim 8 as indefinite under §112, second paragraph, because the examples of TEOS and Zr tert-butoxide in the specification do not belong within the species listed in the Markush group of claim 8, or within the list of possible active groups specified in the specification. Rather, the Examiner asserts that TEOS and Zr tert-butoxide are alkoxides.

Claim 8 is amended to now recite “alkoxides” as a member of the recited Markush group. Applicant submits that this amendment to claim 8 is fully supported by the specification, by way of the specific examples of TEOS and Zr tert-butoxide given in the specification,<sup>1</sup> examples which the Examiner asserts teach the use of “alkoxides”.

In addition, Applicant submits that TEOS is also commonly known in the art as an “ethyl ester of orthosilicic acid”.<sup>2</sup> As such, Applicant submits that the example of TEOS is well within the scope of the Markush group previously recited in claim 8, which included “esters”.

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<sup>1</sup> Specification of S.N. 10/826,613, page 9, lines 9 *et seq.*; page 10, line 1 *et seq.*

<sup>2</sup> See <http://en.wikipedia.org/wiki/TEOS>, copy enclosed.

Applicant submits that the list of potential reagents for the active group “X”, in the description itself at page 8, is an open-ended list. Specifically, that portion of the specification reads: “X may be any active group, included but not limited to esters, such as . . .”.<sup>3</sup> Therefore, the inclusion of the examples of TEOS and Zr tert-butoxide as the active species  $AX_n$  or  $A(R^1)_mX_n$  does not fall outside of the page 8 list of possible species, but would be read by one of ordinary skill in the art to be additional species, to the extent TEOS and Zr tert-butoxide are not within the express list on page 8 of the specification. Accordingly, Applicant submits that the specification, read as a whole, is clear regarding the possible active species available for use in the claimed method, and is therefore enabling to the person of ordinary skill in the art.

Applicant therefore requests reconsideration of the rejection under §112, first paragraph.

Various ones of the claims were also rejected under §112, second paragraph, as indefinite for failing to particularly point out and distinctly claim the subject matter of the invention.

Claim 27 was specifically rejected because it was unclear whether the nucleophilic molecule bonds with the first constituent or with the reactive group. Claim 27 is amended to overcome the rejection, by now simply reciting that the nucleophilic molecule is reacted to displace the exposed reactive group from the applying step, and to covalently bond the nucleophilic molecule with the first constituent. Applicant submits that this amendment to claim 27 removes the source of the apparent lack of clarity to the Examiner, while still fully and clearly reciting the effects of the reacting step, in a manner consistent with the written description.<sup>4</sup> Applicant therefore respectfully submits that amended claim 27 is now sufficiently definite to meet the requirements of §112, second paragraph.

Claim 31 was rejected as indefinite regarding the vagueness of the modifier “large”; claim 31 is amended to overcome the rejection by canceling the word.

Claim 32 was rejected as indefinite regarding the vagueness of the modifier “long”. Claim 32 is amended to overcome the rejection by rephrasing the term “long chain alcohol” as a term of art “long-chain-alcohol”. Applicant submits that those skilled in the art have a clear

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<sup>3</sup> Specification, *supra*, page 8, lines 2 through 6.

<sup>4</sup> Specification, *supra*, page 7, lines 22 through 25; Figures 1 through 3.

understanding of what is meant by the term “long-chain-alcohol”, given its usage in the art.<sup>5</sup> Applicant therefore submits that amended claim 32 is sufficiently definite as to meet the requirements of §112, second paragraph.

Claim 34 was rejected under §112, second paragraph, as indefinite because of the lack of antecedent basis for the phrase “the vapor phase”; claim 34 is amended to strike the article “the”. Applicant submits that amended claim 34 is now sufficiently definite as to meet the requirements of §112 in all respects.

Claims 5, 6, 8, 9, 11, 12, 22, and 27 through 35 were rejected under §102 as anticipated by the Ogawa et al. reference.<sup>6</sup> The Examiner argues that the reference teaches the applying of TEOS or other alkoxy silanes to substrates such as glass, metal and ceramics,<sup>7</sup> followed by a fluoroalkyl trimethoxysilane treatment, in which the fluoroalkyl trimethoxy silane compound undergo a dealcoholization reaction with the adsorbing water and the OH groups at the surface of the coating film form covalent bonds through siloxane bonds.<sup>8</sup> In this regard, the Examiner alleges that the trimethoxy groups hydrolyze to an alcohol, and react with TEOS on the substrate to form a water repellent fluorine-containing coating.<sup>9</sup>

Claim 33 was rejected under §103 as unpatentable over the Ogawa et al. reference. Claims 28 through 30 and 34 were rejected under §103 as unpatentable over the Ogawa et al. reference in view of the Lyons et al. reference.<sup>10</sup>

Applicant respectfully traverses the §102 rejection of claim 27, on the grounds that the rejection is again based on a misapplication of the teachings of the Ogawa et al. reference against the claim.

In making the rejection, the Examiner quotes the portion of the reference reading:

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<sup>5</sup> See <http://en.wikipedia.org/wiki/long-chain-alcohol-oxidase>; <http://en.wikipedia.org/wiki/long-chain-alcohol-dehydrogenase>; copies enclosed.

<sup>6</sup> U.S. Patent Publication No. 2001/0031364, published October 18, 2001, on an application by Ogawa et al. filed March 29, 2001.

<sup>7</sup> Ogawa et al, *supra*, paragraphs [0082] and [0084].

<sup>8</sup> *Id.*, paragraphs [0145] and [0146].

<sup>9</sup> *Id.*, paragraphs [0136] and [0153].

<sup>10</sup> U.S. Patent No. 6,045,864, issued April 4, 2000 to Lyons et al.

. . . the fluoroalkyl trimethoxy silane compound underwent a dealcoholization reaction with the adsorbing water and the OH groups present at the surface of the silica-based coating film, forming covalent bonds through siloxane bonds.<sup>11</sup>

Based on this passage, the Examiner asserts that this dealcoholization reaction taught by the reference meets the reacting step of claim 27, in which “the silane compound has reacted with the coating formed from the TEOS to form a new film”.<sup>12</sup>

This analysis is in error. According to the cited portion of the Ogawa et al. reference, the underlying “silica-based coating film” to which the fluoroalkyl trimethoxy silane compound is later applied is not formed from the application of TEOS. Rather, this silica-based compound is hexamethoxydisiloxane, which is mixed, dissolved in a solvent of ethanol, and applied to a glass substrate.<sup>13</sup> To the extent the rejection depends on a finding that the fluoroalkyl trimethoxy silane reacts with a TEOS film, the rejection is in error.

Secondly, claim 27 requires that the applying step apply an active species comprising a compound of a first constituent and a second constituent, where the second constituent is a reactive group; the reacting step then requires that the nucleophilic molecule displace the reactive group – namely the reactive group from the second constituent of the active species applied in the applying step. For example, the specification of this application describes ethoxy groups from the TEOS active species applied to the oxidized surface as the reactive group of the organic second constituent of the TEOS active species (silicon being the first constituent of this active species).<sup>14</sup>

In contrast, the “adsorbing water and the OH groups present at the surface of the silica-based coating film”, with which the fluoroalkyl trimethoxy silane compound undergoes a dealcoholization reaction, according to the Ogawa et al. reference, are not constituents or reactive groups from the active species applied as the silica-based coating film. Rather, the Ogawa et al. reference clearly teaches that, after the applying of the “silica-based coating film to the surface of a glass substrate”, the adsorbed water and hydroxyl groups on the surface of the

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<sup>11</sup> Ogawa et al., *supra*, paragraph [0146].

<sup>12</sup> Office Action, *supra*, page 5.

<sup>13</sup> Ogawa et al., *supra*, paragraph [0139].

<sup>14</sup> Specification, *supra*, page 9, lines 6 through 31.

substrate are dealcoholized in the evaporation of the ethanol.<sup>15</sup> The substrate is then “placed into an atmosphere containing water”, which causes to coating film 11 to now have “a large water content and including numerous hydroxyl groups (see FIG. 4B)”.<sup>16</sup> As a result, it is this “adsorbing water and [] OH groups”, and nothing in the TEOS originally applied to the substrate, with which the fluoroalkyl trimethoxy silane compound reacts, according to the Ogawa et al. reference.<sup>17</sup> This interpretation is not only consistent with the remainder of the Ogawa et al. reference, it is this introduction of “adsorbing water and OH groups” to the silica-based coating film that is apparently the entire point of the Ogawa et al. invention:

Subsequently, the first organic solvent contained in the first coating film is evaporated, and **thereafter, the substrate is brought into contact with moisture** in the air by, for example, exposing the substrate to the air atmosphere, so as to form a silica-based coating film. **When the first coating film is contacted with water, chlorosilyl groups in the film react with H<sub>2</sub>O, causing dehydrochlorination, and the Cl groups are substituted by the OH groups.** Thus, **a silica-based coating film in which a large number of OH groups are contained is formed.**

It is to be noted here that the prior art methods of producing a silica-based coating film require a high temperature heat treatment in which the film is baked at high temperature (approximately at 250-300° C.) after the film is brought into contact with water. By this treatment, Si—OH groups are dehydrated and thereby bonded with each other by siloxane bonds to form a crosslinked structure, and it is made possible to obtain a silica-based coating film strongly bonded with the substrate. However, **the high temperature heat treatment has at least a disadvantage such that OH groups on the surface of the silica-based coating film are also eliminated.**<sup>18</sup>

Accordingly, Applicant submits that the reacting step of claim 27 is not disclosed by the Ogawa et al. reference, because the reference fails to teach the reacting of a nucleophilic molecule to displace an exposed reactive group of a second constituent of an active species that was applied to the oxidized surface and that includes a first constituent that covalently bonds with that surface, as required by claim 27.

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<sup>15</sup> Ogawa et al., *supra*, paragraph [0140]; *see also* Figure 4A, in which very few OH groups remain.

<sup>16</sup> Ogawa et al., *supra*, paragraph [0142].

<sup>17</sup> Ogawa et al., *supra*, paragraph [0146].

<sup>18</sup> Ogawa et al., *supra*, paragraphs [0087] and [0088], emphasis added.

For these reasons, Applicant submits that the §102 rejection of claim 27 and certain of its dependent claims is in error. Reconsideration is requested.

Applicant further submits that the method of claim 27 and its dependent claims is not only novel, but is patentably distinct over the Ogawa et al. reference and the remainder of the prior art of record in this case.

The method of claim 27 provides the important advantage of forming a single, very thin, coating film that can passivate extremely miniaturized mechanical elements. This extremely thin, single film, formed by this invention, including in some embodiments the formation of a mere monolayer, is especially important and beneficial because of the regularity of such a coating over small features yet extreme topography.<sup>19</sup> This single layer results from the reacting step of claim 27, in which a reactive group from the previously applied active species is displaced by the nucleophilic molecule. Intermolecular forces and the effects of van der Waals, dipole, or capillary forces, are thus prevented from effecting very small moving elements, such as the micromachined device as a digital micromirror.

In contrast, the Ogawa et al. reference teaches the forming of two films, one on top of another. For purposes of context, the “Summary of the Invention” portion of the Ogawa et al. reference is instructive:

In order to solve the foregoing and other problems in the prior art, the invention also provides an anti-contaminant glass for automobiles, comprising:

an anti-contaminant coating film provided on a glass substrate formed in a predetermined shape, and a silica-based coating film interposed between the substrate and the fluorine-containing coating film;

the anti-contaminant coating film produced by the process comprising;

contacting the surface of the substrate with a solution for forming **a silica-based coating film** in a dry atmosphere, the solution comprising a first organic solvent and a silane-based chemically adsorbing substance, thereafter evaporating the first organic solvent, and thereafter, **contacting the silane-based chemically adsorbing substance on the substrate with water, whereby the silica-based coating film having hydroxyl groups is formed;**

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<sup>19</sup> Specification, *supra*, page 2, line 24 through page 3, line 4; page 10, line 18 through page 11, line 24.

contacting the substrate with a solution for forming a fluorine-containing coating film, the solution comprising a fluorine-containing silane-based chemically adsorbing substance and a second organic solvent, and thereafter evaporating the second organic solvent, **whereby the fluorine-containing coating film is formed;** and

baking the substrate in an inert gas atmosphere, **the substrate having the silica-based coating film and the fluorine-containing coating film formed thereon.**<sup>20</sup>

Other portions of the reference similarly describe this process as the forming of a “fluorine-containing coating film” over a “silica-based coating film”.<sup>21</sup> As evident from the Ogawa et al. reference itself, therefore, the purpose of the teachings of that reference are to form two films, one (the fluorine-containing coating film) on top of the other (the silica-based coating film). Indeed, as discussed above, this two-film structure is processed by the application of water to the coated substrate after the forming of the silica-based coating film, prior to the forming of the fluorine-containing coating film. This two-film formation disclosed by the Ogawa et al. reference supports Applicant’s assertion that there is no displacement of a constituent of the previously-applied compound; rather, the Ogawa et al. reference teaches the forming of a first film, further processing that first film, and then the forming of a second film on that first film by a reaction with species introduced by the processing of the first film. Therefore, the Ogawa et al. reference does not teach the forming of a single film, much less such a single film in the form of a “monolayer”, as alleged by the Examiner.<sup>22</sup> Indeed, the large scale items to which the process of the Ogawa et al. reference is intended to be applied (*e.g.*, automobile windshields<sup>23</sup>) negate any suggestion or motivation to modify this two-film process so as to form a single thin film, as results from the method of claim 27 and its dependent claims.

The Lyons et al. reference adds no teaching to those of the Ogawa et al. reference, nor any motivation or suggestion to modify the teachings of the Ogawa et al. reference, in this regard.

Therefore, because each of the claims in this case require the forming of a coating by reacting a nucleophilic molecule to displace an exposed reactive group of a second constituent of

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<sup>20</sup> Ogawa et al., *supra*, paragraphs [0056] through [0061] (emphasis added).

<sup>21</sup> See, e.g., Ogawa et al., *supra*, paragraphs [0079], [0087], and [0088].

<sup>22</sup> Office Action, *supra*, page 5, lines 1 through 3.

<sup>23</sup> Ogawa et al., *supra*, paragraph [0075], Figures 3A and 3B.

an active species applied in the applying of that active species to the oxidized surface, Applicant respectfully submits that the Ogawa et al. reference falls short of the requirements of claim 27. Applicant further submits that there is no motivation from the prior art to modify the teachings of Ogawa et al. in such a manner as to reach claim 27, or any of its dependent claims, given the wide disparity in intended use of the Ogawa et al. reference from the single film formed by the claimed.

Applicant therefore submits that claim 27 and all of its dependent claims are both novel and patentably distinct over the prior art of record in this case.

For these reasons, Applicant respectfully submits that all claims in this case are in condition for allowance. Reconsideration of this application is respectfully requested.

Respectfully submitted,  
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